	Application No.	Applicant(s)
Notice of Allowability	10/674,486	WELLES ET AL.
	Examiner	Art Unit	
	Douglas N Washburn	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *17 June 2004*.

2. ☒ The allowed claim(s) is/are *1-21*.

3. ☒ The drawings filed on *30 September 2003* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some*   c) ☐ None   of the:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the

            International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of

        Paper No./Mail Date _____ .

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)

3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)

6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

EXAMINER'S AMENDMENT

1   An examiner's amendment to the record appears below. Should the changes

and/or additions be unacceptable to applicant, an amendment may be filed as provided

by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be

submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview

with Mr P Yoder on 4November 2004.

Amend the specification as follows:

¶ 0019 "Referring now to the drawing of FIG. 2, a side view of a light source 15 is

shown. Light source 15, is capable of projecting point of light 70 on flat surface

20. Point of light 70 could be from any light source; however, the most accurate

calculations will be achieved by using a light source capable of producing a

[focussed] focused point on surface 20. Further, light source 15 projects point of

light 70 through circle 65, a mathematically describable trajectory. Light source

15, is moved by a rotating device; however, any other device such as an

oscillating device, could be used if it projects point of light 70 in a mathematically

describable trajectory. In the exemplary embodiment of FIG. 1, light source 15 is

configured to move at a constant rate of 5 RPM and controller 25 is configured to

operate cameras 35, 40 and 45 to capture 12 seconds of video data or 360

frames of data at a rate of 30/frames per second for each camera."

Amend the abstract as follows:

"A method for calibrating cameras [is provided. The method] includes moving a point of light on a first <u>flat surface.</u> A first and a second camera are capable of generating a [firs] <u>first</u> frame and a second frame of the point of light <u>respectively.</u> The respective points of light are in a first [field] of view] and a second field of view of the first and second camera. The method includes determining a relative position between the first camera and the second camera based in part on the first frame and the second frame."

Amend claim 4 as follows:

"The method according to claim 1, wherein said <u>determination of relative position is based at least in part on</u> [two frames are] four frames."

Amend claim 10 as follows:

"A method for calibrating cameras comprising:

moving a point of light;

generating a first frame when said point of light is <u>in</u> a first field of view of a first camera;

generating a second frame when said point of light is in a second field of view of a second camera; said first field of view and said second field of view do not overlap;

and capturing data from said first and said second frames, said data includes a first time of said first frame and a second time of said second frame;

determining a relative position between said first and said second cameras based at least in part on said first and said second times."

Prior Art Cited

2   Palm (US 5,699,444) teaches methods for surveying and determining physical location of objects in a scene. Image data captured by one or more cameras and three points from the scene which may either be measured after the images are captured or may be included in the calibrated target placed in the scene at the time of image capture. Objects are located with respect to a three dimensional coordinate system defined with reference to the three points. Palm is silent regarding determining a relative position between a first camera and a second camera based at least in part on first and second frames; determining a relative position between a first and second cameras based at least in part on a first and a second times or a controller connectable to first and second cameras so that controller can capture a first frame from a first camera when a predefined path is within a first field of view of a first camera and a second frame from a second camera when a predefined path is within a second field of view of field of view the second camera, controller being configured to determine an angle of the first camera with respect to the second camera based at least in part on first and second frames.

Davis (US 6,101,455) teaches a work cell containing robots, video cameras, and structured lighting sources is calibrated by observing targets with the cameras as a robot is displaced through a set of offsets. Complete information is recovered about camera calibration data and the structure of illumination from the light sources. Except for the target surface profile, there is no requirement to externally determine any absolute or relative positions, or any relationships either within or between the cameras, targets, light sources, and robots. Either single or multiple cameras (acting independently or in stereo) are calibrated to the robot's coordinate frame, and then optionally used as measuring devices to determine the position and form of the structured light. Davis is silent regarding determining a relative position between a first camera and a second camera based at least in part on first and second frames; determining a relative position between a first and second cameras based at least in part on a first and a second times or a controller connectable to first and second cameras so that controller can capture a first frame from a first camera when a predefined path is within a first field of view of a first camera and a second frame from a second camera when a predefined path is within a second field of view of field of view the second camera, controller being configured to determine an angle of the first camera with respect to the second camera based at least in part on first and second frames.

Krumm (US 6,789039) teaches a method and a system for measuring a relative position and orientation of range cameras using a movement of an object within a scene. In general, the present invention determines the relative pose between two cameras by measuring a path the movement of the object makes within a scene and calculating transformation parameters based on these measurements. These transformation parameters are used to determine the relative position of each camera with respect to a base camera. In a preferred embodiment, the present invention also includes other novel features such as a data synchronization feature that uses a time offset between cameras to obtain the transformation parameters. Krumm is silent regarding determining a relative position between a first camera and a second camera based at least in part on first and second frames; determining a relative position between a first and second cameras based at least in part on a first and a second times or a controller connectable to first and second cameras so that controller can capture a first frame from a first camera when a predefined path is within a first field of view of a first camera and a second frame from a second camera when a predefined path is within a second field of view of field of view the second camera, controller being configured to determine an angle of the first camera with respect to the second camera based at least in part on first and second frames.

Kohler et al. (US 2003/0144815) teaches a method of determining a relative position of first and second imaging devices includes setting an image of a group of mutually different reference patterns and a basic pattern on an imaging medium, with the second imaging device. Each reference pattern of the group is assigned uniquely to one relative position. An image of at least one test pattern is set over the basic pattern by the first imaging device, for forming a combination pattern. A reference pattern is identified from the group of reference patterns. A relative position associated with the identified reference pattern of the group of reference patterns is then identified. Kohler is silent regarding determining a relative position between a first camera and a second camera based at least in part on first and second frames; determining a relative position between a first and second cameras based at least in part on a first and a second times or a controller connectable to first and second cameras so that controller can capture a first frame from a first camera when a predefined path is within a first field of view of a first camera and a second frame from a second camera when a predefined path is within a second field of view of field of view the second camera, controller being configured to determine an angle of the first camera with respect to the second camera based at least in part on first and second frames.

Allowable Subject Matter

3   The following is an examiner's statement of reasons for allowance:

Claim 1 recites, in part, "Determining a relative position between said first camera and said second camera based at least in part on said first and said second frames". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claims 2-9 depend from claim 1.

Claim 10 recites, in part, "Determining a relative position between a first and second cameras based at least in part on a first and a second times". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claims 11-14 depend from claim 10.

Claim 15 recites, in part, "Controller connectable to the first and second cameras so that said controller can capture a first frame from a first camera when a predefined path is within a first field of view of a first camera and a second frame from a second camera when a predefined path is within a second field of view of field of view the second camera, controller being configured to determine an angle of the first camera with respect to the second camera based at least in part on first and second frames". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claims 16-21 depend from claim 15.

It is these limitations, which are not found, taught or suggested in the prior art of record, and are recited in the claimed combination that makes these claims allowable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4   Any inquiry concerning this communication or earlier communications from the
examiner should be directed to Douglas N Washburn whose telephone number is (571)
272-2284. The examiner can normally be reached on Monday through Thursday 6:30
AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's
supervisor, John E Barlow can be reached on (571) 272-2269. The fax phone
number for the organization where this application or proceeding is assigned is
703-872-9306.

Information regarding the status of an application may be obtained from the
Patent Application Information Retrieval (PAIR) system. Status information for
published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR
only. For more information about the PAIR system, see http://pair-
direct.uspto.gov. Should you have questions on access to the Private PAIR
system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-
free).

DNW

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PRIMA   INER

MICHAEL NGHIEM
PRIMARY EXAMINER